

## CLAIMS

1. A rotary piston heat engine system (100) composed of two units (I, II) each comprising two pistons (1, 2) mounted for movement in opposite directions, the pistons being each mounted for rotation in a cylinder (3, 3'), wherein the longitudinal axes (4, 4') of the pistons (2, 2') and cylinder (3, 3') are collinear, and the pistons (1, 2) are mounted for movement in opposite directions, and a plurality of effective cylinder displacements (8, 9, 11, 12) is formed in each case between two radial boundary surfaces (10, 20) of the two respective pistons (1, 2), which execute an angular motion relative to each other when the engine (100) is operating, and at least one mechanism (110) is provided that superimposes a circular motion on the angular motion of the two pistons (1, 2), and each unit comprises a shaft (6, 6') for driving a torque-producing device (5, 5', 5''), and heating means, heat storage means and cooling means connected to a pipe system are provided, by means of which the inlet ports (130, 130'; 131, 131') and outlet ports (140, 140'; 141, 141') of the displacements of the cylinders (3, 3') of the units (I, II) are connected to each other, **characterized in that** a compensating device is provided that balances the positions of the respective pistons in the two units (I, II) in the event of a possible phase shift in the synchronization of the two units (I, II), in order to effect an optimal phase response.

2. A rotary piston heat engine system as defined in claim 1, characterized in that the compensating device (120) is discretely adjustable.
3. A rotary piston heat engine system as defined in claim 2, characterized in that said compensating device (120) is in the form of a toothed belt disposed around the shaft of the two units (I, II) embodied as torque-producing devices (5', 5''), which belt is mounted for displacement by one or more teeth to effect compensation.

(Fig. 11, Fig. 11A)

4. A rotary piston heat engine system as defined in claim 2, characterized in that the compensating device is embodied as an anchoring system (122), in which the respective shafts (6, 6') of the units (I, II) adapted to drive a torque-producing device (5,) are stably mounted in different positions, and in each of these positions meshing of the gear wheels of the torque-producing device with the respective gear wheels of said shafts is guaranteed. (Fig. 12)
5. A rotary piston heat engine system as defined in claim 4, characterized in that the anchoring system is embodied as a gearbox in which the respective shafts (6, 6') of the units adapted to drive a torque-producing device (5; 5', 5'') are stably mounted in different positions and in each of these positions meshing of

the gear wheels of the torque-producing device with the respective gear wheels on the shafts is assured.

6. A rotary piston heat engine system as defined in claim 4, characterized in that the anchoring system is in the form of a cover plate in which the respective shafts (6, 6') of the units adapted to drive a torque-producing device (5; 5', 5'') are stably mounted in different positions and in each of these positions meshing of the gear wheels of the torque-producing device with the respective gear wheels on the shafts is assured.
7. A rotary piston heat engine system as defined in claim 5 or claim 6, characterized in that the respective shafts (6, 6') of the units adapted to drive a torque-producing device (5; 5', 5'') are disposed relative to each other at a fixed angle of 135 °s or 125 °s, there being assigned to each shaft (6, 6') a respective bore A, A' and B, B', respectively, for each of these angular configurations.

(Fig. 12, Fig. 12A)

8. A rotary piston heat engine system as defined in claim 1, characterized in that said compensating device (240, 241) is continuously adjustable . (Fig. 13)

Effect:

This makes it possible to effect a very quick change of output.

Furthermore, engine braking is enable by producing, via controllable adjustment means, an sufficiently large mis-phase displacement.

9. A rotary piston heat engine system as defined in claim 8, characterized in that said compensating device is in the form of two displaceable rollers (240, 241) disposed between the two torque-producing devices (5', 5'') of the two units (I, II) and are drivingly connected to the torque-producing devices (5', 5'') via a toothed belt, which displaceable rollers (240, 241) are reciprocately displaceable over a mutually variable distance in a direction perpendicular to the connecting line of the torque-producing devices (5', 5'').
10. A rotary piston heat engine system as defined in claim 9, characterized in that the two displaceable rollers (240, 241) are in the form of excentric rollers.
11. A rotary piston heat engine system as defined in any one of claims 1 to 10, characterized in that a first inlet port (130) of a diametrically opposed first pair of inlet ports (130, 130) of a first cylinder (3) and a first outlet port (140) of a diametrically opposed first pair of outlet ports (140, 140) of the first cylinder (3) are separated from each other by 0.5 ° to 8 ° and a second inlet port (130) of the

diametrically opposed first pair of inlet ports (130, 130) and a second outlet port (140) of the diametrically opposed first pair of outlet ports (140, 140) are separated from each other by an angular distance of approximately 55 to 95 °.

(Energy-optimized operation of the device)

(Fig. 14, 14A, 14B)

12. A rotary piston heat engine system as defined in claim 11, characterized in that a first inlet port (130) of the diametrically opposed first pair of inlet ports (130, 130) and a first outlet port (140) of the diametrically opposed first pair of outlet ports (140, 140) are separated from each other by 4 °.
13. A rotary piston heat engine system as defined in claim 11 or claim 12, characterized in that a second inlet port (130) of the diametrically opposed first pair of inlet ports (130, 130) and a second outlet port (140) of the diametrically opposed first pair of outlet ports (140, 140) are separated from each other by an angular distance of approximately 77 °.
14. A rotary piston heat engine system as defined in any one of claims 1 to 13, characterized in that a first inlet port (131) of a diametrically opposed second pair of inlet ports (131, 131) of a second cylinder (3) and a first outlet port (141) of a diametrically opposed second pair of outlet ports (141, 141) of the

second cylinder (3) are separated from each other by an angular distance of approximately  $25^{\circ}$  to  $45^{\circ}$  and a second inlet port (131) of the diametrically opposed second pair of inlet ports (131, 131) and a second outlet port (141) of the diametrically opposed second pair of outlet ports (141, 141) are separated from each other by an angular distance of approximately  $30^{\circ}$  to  $60^{\circ}$ .

(Fig. 15, 15A, 15B)

(Energy-optimized operation of the system)

15. A rotary piston heat engine system as defined in claim 14, characterized in that a first inlet port (131) of the diametrically opposed second pair of inlet ports (131, 131') and a first outlet port (141) of the diametrically opposed second pair of outlet ports (141, 141') are separated from each other by an angular distance of approximately  $34^{\circ}$ .
16. A rotary piston heat engine system as defined in claim 14 or claim 15, characterized in that a second inlet port (131) of the diametrically opposed second pair of inlet ports (131, 131') and a second outlet port (141) of the diametrically opposed second pair of outlet ports (141, 141') are separated from each other by an angular distance of approximately  $47^{\circ}$ .
17. A rotary piston heat engine system as defined in any one of claims 11 to 16, characterized in that all

inlet ports and outlet ports in the cylinder head (33; 33') are provided in a respective cylinder (3; 3').

18. A rotary piston heat engine system as defined in any one or more of the previous claims, characterized in that additionally heat storage means are provided which are connected to the heating means and the cooling means.
19. A rotary piston heat engine system as defined in any one or more of the previous claims, characterized in that the two units are such that that part of the system (5, 102, 103) from which the torque of the rotary piston engine (100) can be outputted is driven by both units (I, II), and heating means, heat storage means and cooling means in conjunction with a piping system are provided, which piping system connects the inlet ports and outlet ports of the piston displacements of the at least one cylinder (3) of the units (I, II) to each other are.
20. Use of a rotary piston heat engine system as defined in any one of the previous claims as a heat pump by supplying rotational energy to the torque-producing devices (5; 5', 5'').
21. Use of a rotary piston heat engine system as defined in any one of the previous claims as a refrigerating machine by supplying rotational energy to the torque-producing devices (5; 5', 5'').